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10/676,913	10/01/2003	Kaushik Rajashekara	DP-310113	8280
22851	7590	08/01/2006	EXAMINER	
DELPHI TECHNOLOGIES, INC.			ECHELMeyer, ALIX ELIZABETH	
M/C 480-410-202			ART UNIT	
PO BOX 5052			PAPER NUMBER	
TROY, MI 48007			1745	

DATE MAILED: 08/01/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/676,913

Applicant(s)

RAJASHEKARA ET AL.

Examiner

Alix Elizabeth Echelmeyer

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 01 October 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 10-1-03.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Information Disclosure Statement***

1. The Information Disclosure Statement has been considered.

### ***Specification***

2. The abstract of the disclosure is objected to because it references a US Patent application but fails to provide the serial number (page 1 line 8). The application serial number is 10/676,549. Correction is required. See MPEP § 608.01(b).

### ***Claim Objections***

3. Claims 8 and 9 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claims, or amend the claims to place the claims in proper dependent form, or rewrite the claims in independent form. The examiner suggests that claim 1 should be amended to be drawn to at least one solid oxide fuel cell and at least one thermo photovoltaic device. For the purposes of the examination of those claims in this action, claim 1 will be interpreted to have been amended as suggested.

4. Claim 10 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of claim 3. Applicant is required to cancel the claim, or amend the claim to place the claim in proper dependent form, or

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rewrite the claims in independent form. The operation temperatures defined in claim 10 do not further limit the apparatus of claim 3 and thus does not further define claim 3.

5. Claim 12 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of claim 1. Applicant is required to cancel the claim, or amend the claim to place the claim in proper dependent form, or rewrite the claim in independent form. Claim 12 is drawn to operational capabilities of the apparatus of claim 1 but does not further define the apparatus.

***Claim Rejections - 35 USC § 112***

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. Claims 14 and 20 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claims contains subject matter that was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The claims are drawn to a fuel cell system that generates waste heat before, during and after generating power; however, the waste heat as claimed in claim 1 is generated by the operation of the fuel cell. It is unclear how the fuel cell can generate

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heat while it is not in operation. The claim is being interpreted to be drawn to waste heat being generated during the operation of the fuel cell.

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claim 6 provides for the use of the power supply in a vehicle or any power generation system, but, since the claim does not set forth any steps involved in the method/process, it is unclear what method/process applicant is intending to encompass. A claim is indefinite where it merely recites a use without any active, positive steps delimiting how this use is actually practiced.

10. Claim 6 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The limitation "any power generating device" as found to be indefinite.

11. Claim 9 recites the limitation "said" in plurality of thermo photovoltaic devices. There is insufficient antecedent basis for this limitation in the claim, as claim 1 does not claim a plurality of thermo photovoltaic devices.

### ***Claim Rejections - 35 USC § 101***

12. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

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13. Claim 6 is rejected under 35 U.S.C. 101 because the claimed recitation of a use, without setting forth any steps involved in the process, results in an improper definition of a process, i.e., results in a claim which is not a proper process claim under 35 U.S.C. 101. See for example *Ex parte Dunki*, 153 USPQ 678 (Bd.App. 1967) and *Clinical Products, Ltd. v. Brenner*, 255 F. Supp. 131, 149 USPQ 475 (D.D.C. 1966).

### ***Claim Rejections - 35 USC § 103***

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

15. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

16. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation

under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

17. Claims 1-4, 8, 10, 12-17 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nomura et al. (US Pre-Grant Publication 2002/0081469) in view of Nakayama et al. (US Pre-Grant Publication 2002/0148498).

Regarding claims 1 and 15, Nomura et al. teach a solid oxide fuel cell system wherein unused fuel and exhaust gases from the fuel cell as well as fuel that has not entered the fuel cell are transferred to a combustor. The combustor and evaporator are in line with one another and are used to heat the reformer and fuel cell system during the start-up phase (Figure 1, [0057]-[0059]). The fuel cell system further comprises a system control unit ([0063]-[0064]).

Regarding claims 2, 3, 4, 16 and 17, Nomura et al. teach the transport of exhaust air from the fuel cell stack, which operates at a high temperature, to the combustor (Figure 1). Further, as seen in Figure 1, all exhaust products, including unused fuel, are provided to the combustor from the fuel cell.

Regarding claim 10, since Nomura teaches a solid oxide fuel cell and solid oxide fuel cells are known to operate at temperatures within the range in claim 10, the fuel cell of Nomura is capable of generating waste heat within that range.

As for claim 12, the combustor of Nomura et al. is used to heat the system during start-up ([0057]-[0059]). Nomura et al. further teach a control system, which would be capable of being programmed to meet the desired limitations of claim 13.

Regarding claims 14 and 20, the fuel cell of Nomura et al. generates heat during operation.

Nomura et al. fail to teach a thermo photovoltaic (TPV) cell that uses heat and other exhaust from the fuel cell stack to provide more power to the load on the system.

Nakayama et al. teach a TPV power generating apparatus that is heated by the combustion gas produced by the reaction of fuel and air (abstract). The heat of the combustion gas is used to heat the emitter, which radiates infrared light that is absorbed by the TPV cells and turned into power ([0024]). Nakayama et al. further teach the use of preheated air in the combustor because it increases the combustion gas temperature, thus increasing the amount of electrical power generated ([0014]).

Nakayama et al. teach that the efficiency of the TPV cells is increased by using the heat of combustion gas as opposed to other sources of heat ([0011]).

It would be advantageous to use the combustor-TPV system of Nakayama et al. in the fuel cell system of Nomura et al. because the fuel cell system already contains a combustor and by substituting the combustor-TPV of Nakayama, the efficiency of the TPV would be increased and the overall system of Nomura et al. would be improved by using the waste heat of the fuel cell to create more power.

As for claim 8, Nomura et al. disclose the claimed invention except for the plurality of fuel cell stacks and plurality of TPV devices. It would have been obvious to



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one having ordinary skill in the art at the time the invention was made to use more than one of each of these parts, since it has been held that mere duplication of essential working parts of a device involves only routine skill in the art (MPEP 2144.04 (VI)). Further, a plurality of TPV devices would yield a higher power output of the system.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to combine the combustor-TPV of Nakayama et al. with the fuel cell system of Nomura et al. in order to create a system that was more efficient and produced more power than the original fuel cell system alone.

18. Claims 5, 6, 9, 11 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nomura et al. in view of Nakayama et al. as applied to claims 1 and 17 above, and further in view of Iwasaki et al. (US Pre-Grant Publication 2002/0114988).

The teachings of Nomura et al. and Nakayama et al. as discussed above are incorporated herein.

Nomura et al. and Nakayama et al. teach a fuel cell system also containing a TPV for added power generation but fail to teach a heat exchanger to cool the TPV and heat the fuel cell system. Regarding claim 6, Nomura et al. teach the use of the fuel cell system in a vehicle ([0005]).

Iwasaki et al. teach a heat exchanger that uses exhaust from a combustor and outside air to provide heat to the fuel cell (abstract, Figure 1). Regarding claim 11, the heat exchanger of Iwasaki et al. uses unheated air ([0024]).

It would be desirable to use the heat exchanger of Iwasaki et al. with the fuel cell system of Nomura et al. and Nakayama et al. because the use of the heat generated by the combustor-TPV combination in the system instead of simply allowing it to exhaust out of the system would increase the efficiency of the overall system.

As for claim 9, the combination of Iwasaki et al. with Nomura et al. and Nakayama et al. discloses the claimed invention except for a heat exchanger connected to a plurality of TPV devices. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide several TPV devices, since it has been held that mere duplication of essential working parts of a device involves only routine skill in the art (MPEP 2144.04 (VI)). Further, a plurality of TPV devices would yield a higher power output of the system.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to combine the heat exchanger of Iwasaki et al. with the system of Nomura et al. in view of Nakayama et al. in order to increase the efficiency of the system.

19. Claims 7 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nomura et al., Nakayama et al. and Iwasaki et al. as applied to claims 1, 6 and 15 above, and further in view of Sanderson (US Patent Number 6,989,209).

The teachings of Nomura et al., Nakayama et al. and Iwasaki et al. as discussed above are incorporated herein.

Regarding claim 7, Nomura et al., Nakayama et al. and Iwasaki et al. teach the heat exchanger used to cool the TPV cell and the system used power a vehicle but fail to teach a power conditioner for receiving and conditioning the power generated by the system.

Sanderson teaches an energy cycle unit that takes energy from the combustor of the fuel cell system and provides it to a generator (Figure 1, column 4 lines 59-67, column 5 lines 1-14).

It would be desirable to condition the power generated in the system to be used in the intended application because if this step were not taken the system would not serve its intended purpose.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to combine the energy cycle unit of Sanderson with the system of Nomura et al., Nakayama et al. and Iwasaki et al. in order to ensure that the power generated by the system would be used in the intended device.

As for claim 19, Nomura et al. and Nakayama et al. teach the use of exhaust heat from the fuel cell stack in the combustor used to provide heat to the TPV. Nomura et al. and Nakayama et al. fail to teach the temperature at which the exhaust products leave the fuel cell.

Sanderson teaches a solid oxide fuel cell such as the one used in Nomura et al. As seen in Figure 3 of Sanderson, the exhaust products leave the solid fuel cell at 849 degrees Celsius.

**Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alix Elizabeth Echelmeyer whose telephone number is 571-272-1101. The examiner can normally be reached on Mon-Fri 7-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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PRIMARY EXAMINER

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